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(54) Hybrid disc and method for discriminating same

(57) A DVD playback apparatus accurately discriminates a hybrid disc, to prevent a recordable CD installed therein from being damaged by a laser beam for DVD/MMCD. The hybrid disc includes a label printed surface formed on a substrate, a CD recording surface formed below the label printed surface, having identification information expressing the disc type, and a DVD recording surface formed below the CD recording surface. The DVD playback apparatus irradiates a CD laser beam on an optical disc installed therein. If data is readable from the optical disc, it is checked whether the identification information is recorded in the predetermined recording area. The DVD playback apparatus recognizes the optical disc as the hybrid disc, if the identification information is recorded in the predetermined recording area.

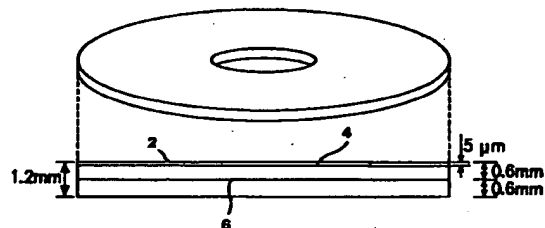


FIG. 1

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## Description

[0001] The present invention relates to an optical disc playback apparatus, and in particular, to an unproved hybrid disc and a method for discriminating the same.

[0002] A digital versatile disk (hereinafter, called "DVD" for short) playback apparatus can playback both a CD (compact disk) and a DVD. Thus, the DVD playback apparatus has a function of discriminating a type of the disc installed therein, to set a proper playback mode according to the disc type.

[0003] In discriminating the disc type, the DVD playback apparatus checks whether an installed disc is a DVD or a CD upon installation of the disc, and sets a proper playback mode according to the detected disc type. More specifically, upon installation of the disc, the DVD playback apparatus irradiates a laser beam for DVD/MMCD (hereinafter, referred to "DVD/MMCD laser beam" for short) having a wavelength of 650nm on the surface of the disc, to read data recorded thereon. At this moment, if the data recorded on the disc is readable, the DVD playback apparatus recognizes the installed disc as a DVD and begins to read and playback the data recorded on the DVD. On the contrary, however, if the data recorded on the installed disc is unreadable, the DVD playback apparatus irradiates a laser beam for CD (hereinafter, referred to "CD laser beam" for short) having a wavelength of 780nm on the surface of the disc to read the data recorded on the installed disc. If the data recorded on the disc is readable, the DVD playback apparatus recognizes the installed disc as a CD, and begins to read and playback the data recorded thereon.

[0004] However, unlike a general CD (i.e., read-only CD), a recordable CD may be damaged undesirably, when exposed to the DVD/MMCD laser beam with a wavelength of 650nm. In order to prevent the recordable CD from being damaged by the DVD/MMCD laser beam, an unproved DVD playback apparatus first checks whether the installed disc is a CD or not and thereafter, checks whether the installed disc is a DVD, if it is not the CD.

[0005] With an increasing demand for a multipurpose optical recording medium, a hybrid disc has been proposed which is compatible with both a CD playback apparatus and the DVD playback apparatus. Such a hybrid disc is applicable to a CD-ROM/DVD-ROM, a video-CD/DVD-video, a CD-DA (digital audio)/DVD-audio, etc.

[0006] Referring to Fig. 1, the hybrid disc is composed of a poly-carbonate substrate having a diameter of 12cm and a thickness of 1.2mm. The hybrid disc includes a CD recording surface 4 positioned about 5 $\mu$ m below a label printed surface 2, and a DVD/MMCD recording surface 6 positioned about 0.6mm below the label printed surface 2. The CD recording surface 4 has a reflection factor of about 70%, and the DVD/MMCD recording surface 6 has a reflection factor of about 30%.

As a combined CD and DVD recording medium, the hybrid disc is recognizable as a CD in the CD playback apparatus, and as a DVD in the DVD playback apparatus. CD data is recorded on the CD recording surface 4, and DVD data is recorded on the DVD/MMCD recording surface 6.

[0007] Therefore, the CD playback apparatus irradiates the CD laser beam on the hybrid disc, to read data recorded on the CD recording surface 4, and the DVD playback apparatus irradiates the DVD/MMCD laser beam on the hybrid disc, to read data recorded on the DVD/MMCD recording surface 6.

[0008] However, in case the DVD playback apparatus first checks whether the installed disc is a CD or not as mentioned above, to prevent the CD from being damaged in the course of discriminating the disc type, the DVD playback apparatus may mis-recognize the hybrid disc as a CD by reading the data recorded on the CD recording surface 4 of the hybrid disc.

[0009] It is therefore the object of the present invention to provide an improved hybrid disc and a method for accurately discriminating a hybrid disc, thereby to prevent a recordable CD from being damaged by a laser beam for DVD/MMCD.

[0010] To achieve the above objects, a hybrid disc includes a substrate; a label printed surface formed on the substrate; a CD recording surface formed below the label printed surface, having identification information expressing a disc type recorded in a predetermined recording area; and a DVD recording surface formed below the CD recording surface.

[0011] Further, a method for discriminating the hybrid disc in a DVD playback apparatus includes the steps of irradiating a CD laser beam on an optical disc installed in the DVD playback apparatus; if data is readable from the optical disc, checking whether the identification information is recorded in the predetermined recording area; and recognizing the optical disc as the hybrid disc, if the identification information is recorded in the predetermined recording area.

[0012] The above and other objects, features and advantages of the present invention will become more apparent in the light of the following detailed description of an exemplary embodiment thereof taken with the attached drawings in which:

Fig. 1 illustrates a known hybrid disc;

Fig. 2 is a schematic block diagram of a DVD playback apparatus to which the present invention is applicable;

Fig. 3 is a flow chart for discriminating a hybrid disc according to a preferred embodiment of the present invention.

[0013] A hybrid disc according to a preferred embodiment of the present invention has identification information expressing the disc type, which is recorded on a particular recording area such as a file, a sector, or TOC

(table of contents) which are not used in general in a CD recording surface 4 of Fig. 1. The identification information is utilized when a DVD playback apparatus discriminates the disc type.

[0014] Fig. 2 shows a block diagram of a DVD playback apparatus to which the present invention is applicable. As illustrated in the drawing, an optical disc 10 is revolved by a spindle motor 12. An optical pickup 14 irradiates a CD laser beam with a wavelength of 780nm or a DVD/MMCD laser beam with a wavelength of 650nm on a surface of the revolving optical disc 10 under the control of a microprocessor 20, to read data recorded on the optical disc 10. The read data is amplified and reshaped at an RF (radio frequency) module 16. A servo 18 controls the spindle motor 12 and the optical pickup 14 according to servo information received from the RF module 16.

[0015] The data output from the RF module 16 is processed by an error correction and system parser 26, and decoded by an AV (audio-visual) decoder 24. Video data and audio data of the decoded data are converted into a video signal and an audio signal by a video processor 28 and an audio processor 30, respectively. The microprocessor 20 controls the overall operation of the DVD playback apparatus. A user interface 22 allows a user to input various control commands and displays various information thereon under the control of the microprocessor 20.

[0016] In the following, a procedure for discriminating the disc according to the present invention will be described in detail with reference to Figs. 2 and 3.

[0017] If the optical disc 10 is installed in the DVD playback apparatus of Fig. 2, the optical pickup 14 irradiates the CD laser beam with a wavelength of 780nm on the surface of the optical disc 10 under the control of the microprocessor 20, at a step 32. Here, if the optical disc 10 is a hybrid disc, the optical pickup 14 reads the data recorded on the CD recording surface 4; otherwise, if the optical disc 10 is a CD (i.e., read-only CD) or a recordable CD, the optical pickup 14 reads the data recorded on the CD or the recordable CD under the control of the microprocessor 20.

[0018] Then, the microprocessor 20 checks at a step 34 whether the data recorded on the installed optical disc 10 is readable or not. If the data is readable, the optical pickup 14 reads data recorded on a predetermined area of the installed optical disc 10 under the control of the microprocessor 20, at a step 36. It should be noted that the hybrid disc has the identification information recorded on the predetermined area, while the CD or recordable CD does not have the identification information recorded thereon.

[0019] At a step 38, the microprocessor 20 checks whether the data read from the predetermined area is the identification information expressing the hybrid disc. At the result, if the read data is the identification data, the microprocessor 20 recognizes the installed optical disc 10 as a hybrid disc, and goes to a step 40. How-

ever, if the read data is not the identification data, the microprocessor 20 recognizes the installed optical disc 10 as a CD or a recordable CD, and goes to a step 42.

[0020] If the read data is the identification data, the user interface 22 displays thereon a message expressing that the installed optical disc 10 is a hybrid disc and the user should select one of a CD playback mode or a DVD playback mode, under the control of the microprocessor 20. In reply to the message, the user will select at step 40 one of the two playback modes by way of the user interface 22. If the user selects the CD playback mode, the procedure goes to step 42 to perform the CD playback mode. On the contrary, if the user selects the DVD playback mode, the procedure goes to a step 44 to perform the DVD playback mode.

[0021] If the data recorded on the installed optical disc 10 is unreadable at the step 34, the optical pickup 14 will irradiate the DVD/MMCD laser beam with a wavelength of 650nm on the installed optical disc 10 under the control of the microprocessor 20. Here, if the installed optical disc 10 is a DVD, the DVD playback apparatus can read the data. However, if the installed disc 10 is a different type of the disc such as MD (mini disc) and MOD (magneto optical disc), the DVD playback apparatus can not read the data.

[0022] The microprocessor 20 checks at a step 48 whether the data is readable or not. If the data is readable, the microprocessor 20 recognizes the installed optical disc 10 as a DVD and sets the DVD playback mode at step 44. If the data is unreadable, it is considered that the installed disc is neither a CD nor a DVD. Thus, the DVD playback apparatus performs a procedure for discriminating other disc types, at a step 50.

[0023] In summary, in case a recordable CD is installed, the DVD playback apparatus irradiates the CD laser beam with a wavelength of 780nm on the recordable CD. If the data is readable, the DVD playback apparatus reads the data recorded on the predetermined recording area. Since the recordable CD does not have the identification information on the predetermined recording area, the DVD playback apparatus recognizes the recordable CD as a general CD (i.e., read-only CD), and sets the CD playback mode. That is, the DVD playback apparatus does not irradiate the DVD/MMCD laser beam with a wavelength of 650nm on the surface of the recordable CD, so that the recordable CD may not be damaged.

[0024] Further, in case the hybrid disc is installed, the DVD playback apparatus irradiates the CD laser beam. If the data is readable, the DVD playback apparatus reads the identification information recorded on the predetermined recording area of the hybrid disc. As the result, the DVD playback apparatus recognizes the installed CD as a hybrid disc, and displays on the user interface 22 the message expressing that the user should select one of the CD playback mode and the DVD playback mode. Then, the DVD playback apparatus will be set to one of the CD playback mode and the

DVD playback mode according to the user's selection. Of course, the DVD playback apparatus may automatically select one of the two operation modes.

[0025] Moreover, in case the DVD is installed, the DVD playback apparatus irradiates the CD laser beam on the DVD. In this case, since the data is unreadable, the DVD playback apparatus again irradiates the DVD/MMCD laser beam on the DVD, to read the data recorded thereon.

[0026] As can be clearly understood from the foregoing descriptions, the DVD playback apparatus of the invention can accurately discriminate the hybrid disc and prevent the recordable CD from being damaged by the DVD/MMCD laser beam.

#### Claims

##### 1. A hybrid disc comprising:

a substrate having a label printed surface (2) and a first and second recording surface (4,6), the label printed surface (2) being formed on said substrate;  
the first recording surface (4) being formed in a first depth below said label printed surface (2), and  
the second recording surface (6) being formed in a second depth below said label printed surface (2), said second depth being greater than said first depth,  
characterized in that  
the first recording surface (4) has identification information expressing a disc type recorded in a predetermined recording area.

2. The hybrid disc according to claim 1, wherein said first recording surface (4) is a CD (compact disc) recording surface on which CD data is recorded, wherein said second recording surface (6) is a DVD (digital versatile disc) recording surface on which DVD data is recorded.

3. The hybrid disc according to claim 1 or 2, wherein said predetermined recording area is a file, a sector, or a TOC (table of contents) which is not used with discs other than the hybrid disc.

4. A method for discriminating a hybrid disc in a DVD playback apparatus, said hybrid disc having identification information expressing a disc type being recorded in a predetermined recording area, the method comprising the steps of:

irradiating (32) a CD laser beam on an optical disk (10) installed in said DVD playback apparatus;  
checking (36,38) whether said identification information is recorded in said predetermined

recording area if data is readable from said optical disc; and

recognizing (38) said optical disc as the hybrid disc, if said identification information is recorded in said predetermined recording area.

5. The method for discriminating a hybrid disc according to claim 4, further comprising the step of

setting (42) a CD playback mode, if said identification information is not recorded in said predetermined recording area.

6. The method for discriminating a hybrid disc according to claim 4 or 5, further comprising the steps of:

displaying (40) a message requesting to select one of a CD playback mode and a DVD playback mode, if said identification information is recorded in said predetermined recording area; and  
selectively setting (42,44) one of the CD playback mode and the DVD playback mode according to a selection of the playback modes.

7. The method for discriminating a hybrid disc according to claim 6, wherein said predetermined recording area is a file, a sector, or a TOC (table of contents) which is not used with discs other than the hybrid disc.

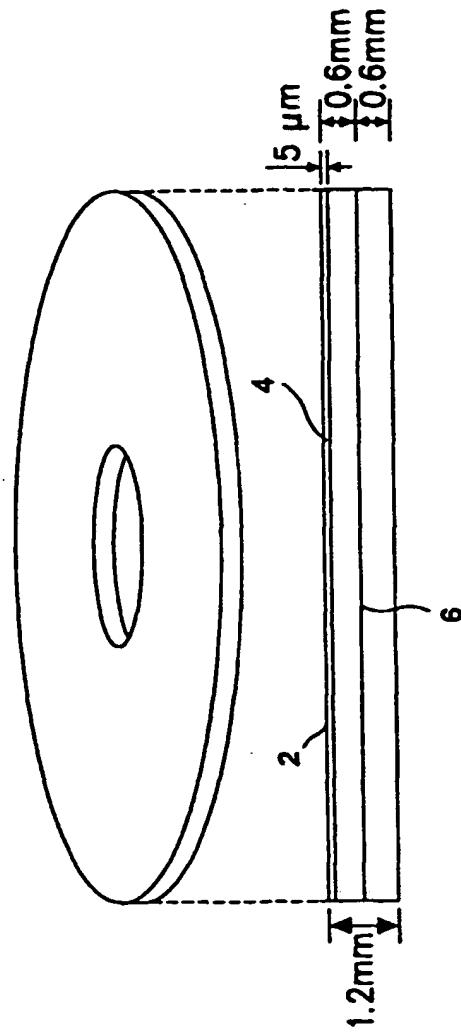


FIG. 1

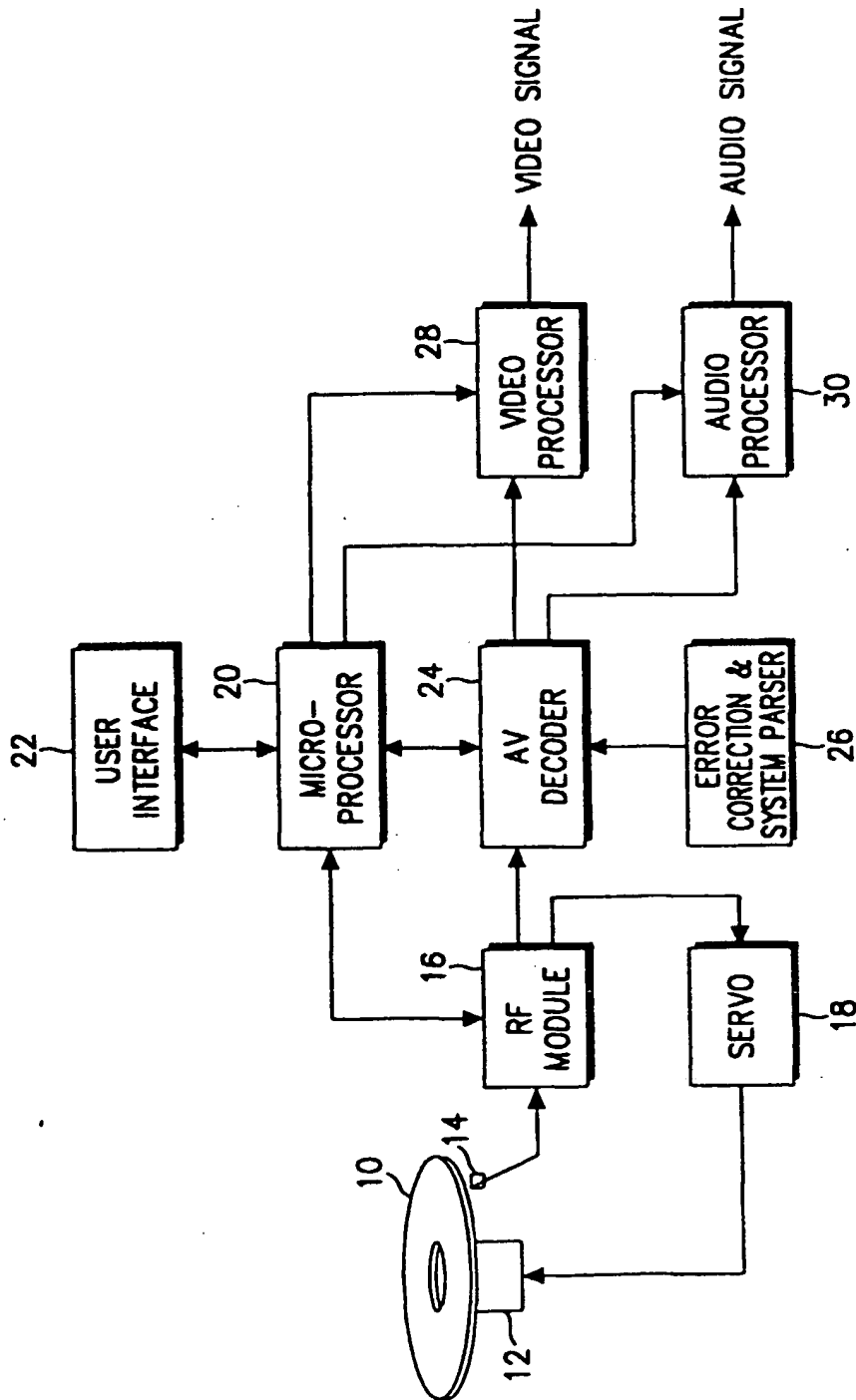


FIG. 2

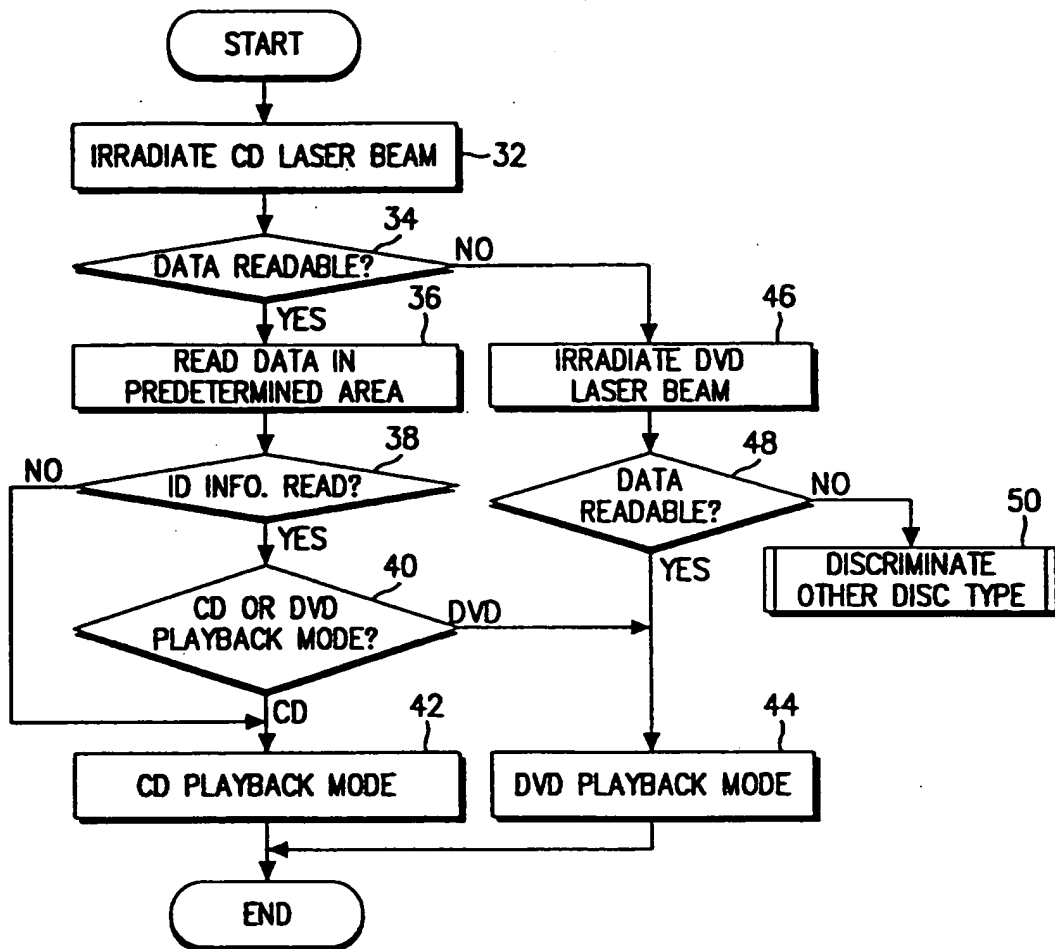


FIG. 3